UNITED STATES PATENT AND TRADEMARK OFFICE

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/814,146	04/01/2004	Se-Wan Kim	0630-1988PUS1	7347

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EXAMINER
OLSEN, LIN B

ART UNIT	PAPER NUMBER
3661	

NOTIFICATION DATE	DELIVERY MODE
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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

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	Application No.	Applicant(s)
	10/814,146	KIM, SE-WAN
Office Action Summary	Examiner	Art Unit	
	LIN B. OLSEN	3661	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE <u>3</u> MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.
- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on <u>07 July 2008</u>.
2a)☐ This action is **FINAL**.   2b)☒ This action is non-final.
3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) <u>1,2,5,6,8-15,17 and 18</u> is/are pending in the application.
   4a) Of the above claim(s) _____ is/are withdrawn from consideration.
5)☐ Claim(s) _____ is/are allowed.
6)☒ Claim(s) <u>1-2,5-6,8-15 & 17-18</u> is/are rejected.
7)☐ Claim(s) _____ is/are objected to.
8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.
10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.
   Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
   Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
   a)☒ All   b)☐ Some * c)☐ None of:
      1.☒ Certified copies of the priority documents have been received.
      2.☐ Certified copies of the priority documents have been received in Application No. _____.
      3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
   * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1)☒ Notice of References Cited (PTO-892)
2)☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3)☐ Information Disclosure Statement(s) (PTO/SB/08)
   Paper No(s)/Mail Date _____.
4)☐ Interview Summary (PTO-413)
   Paper No(s)/Mail Date. _____ .
5)☐ Notice of Informal Patent Application
6)☐ Other: _____.

DETAILED ACTION

Allowable Subject Matter

The indicated allowability of claims 8 and 16-18 is withdrawn in view of the newly discovered reference(s) to Lee. Rejections based on the newly cited reference(s) follow.

Response to Amendment

The amendments to claims 1, 8, 12-14, 17 and 18 have been entered.

Response to Arguments

In light of the amendments made, the objection to claim 18 and rejection of claims 1, 4, 8, 12-4, and 16-18 under 35 USC § 112 have been withdrawn.

The terminal disclaimer filed on July 7, 2008 disclaiming the terminal portion of any patent granted on this application which would extend beyond the expiration date of Patent No. 7,328,088 has been reviewed and is accepted. The terminal disclaimer has been recorded.

Claim Objections

Claims 1, 8, 12, 13, 17 and 18 are objected to because of the following informalities: In claims 1, 12 and 13, lines 13, 3 and 3 respectively, the term "unit" is used when "units" is more appropriate and in claims 8, 17 and 18, lines 18, 17 and 17 respectively, "signals" is used when "signal" would be more appropriate. Appropriate correction is required.

Claim 8 is objected to because of the following informalities: On line 8 of the amended claim, the claim recites "which a radio frequency (RF) signal is emitted;" The Examiner suggests the article should be "the" since an RF (radio frequency) is recited in line 3. . Appropriate correction is required.

Claim 17 is objected to because of the following informalities: In the penultimate line, the claim recites "received the ultrasonic signal among the plurality". The Examiner suggests the word "first" should be inserted between "signal" and "among". Appropriate correction is required.

Claim Rejections - 35 USC § 112

The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

Claims 1 is rejected under 35 U.S.C. 112, second paragraph, as being incomplete for omitting essential structural cooperative relationships of elements, such omission amounting to a gap between the necessary structural connections. See MPEP § 2172.01. The omitted structural cooperative relationships are: At page 6 line 24 and page 7 line 3 the ultrasonic signal oscillating units are described as oscillated

sequentially after the RF signal is received by the RF reception unit, whereas the claim

recites "each ultrasonic signal being generated based on a point of time at which a radio

frequency (RF) signal is emitted from the mobile robot".

Claim Rejections - 35 USC § 103

The text of those sections of Title 35, U.S. Code not included in this action can

be found in a prior Office action.

Claims **1-2, 5-6, 8-15 and 17-18** are rejected under 35 U.S.C. 103(a) as being

unpatentable over U.S. Patent No. 4,758,691 to De Bruyne (De Bruyne) in view of U.S.

Patent No. 4,207,571 to Passey (Passey) and U.S. Patent Pub. No. 2004/0158354 to

Lee et al. (Lee). De Bruyne teaches an apparatus for determining the position of a

movable object. Passey is concerned with navigation aids. Lee is concerned with a

robot localization system. Among the references, electrical signals (RF or IR etc) are

typically used as a synchronizing signal, and sonic signals are most times used to

measure distance, since a sonic sensor is relatively inexpensive. The Examiner takes

official notice that all electrical signals travel significantly faster than sonic signals and

that the source location of the synchronizing pulse can be chosen between the robot

and docking station with only a minor modification in formulas.

Regarding independent **claim 1**, "A method for detecting a position of a mobile

robot, the method comprising:" - "a mobile robot" in the preamble, reads on De

Bruyne's movable object, because none of the functions of a robot are used or referred

to in the body of the claim. It is the fact that both the robot and movable object move that requires that a means be found to determine the object's position.

"calculating time taken for each ultrasonic signal generated by a plurality of ultrasonic signal oscillating units of a charging station to reach the mobile robot, the each ultrasound signal being generated based on a point of time at which a radio frequency (RF) signal is emitted from the mobile robot; and" - reads on De Bruyne col. 2, lines 64-68 where the method successively measures the traveling times of ultrasonic pulses from two transmitters on a base station to the ultrasound receiver on the moving object. The measurement is from a the time of a transmission of pulses in the region of visible or invisible light to indicate the start of the ultrasonic transmissions, col. 2, lines 4-10. The examiner takes official notice that both RF frequencies and visible and invisible light frequencies travel at the same speed and are hence equivalent in this application.

"calculating a distance between the charging station and the mobile robot based on the calculated reaching time; and" - reads on De Bruyne col.3, lines 18-23 where the distances d1 and d2 are determined.

"calculating an angle between the charging station and the mobile robot based on the calculated distance value and a preset distance value between the plurality of ultrasonic signal oscillating units," - Reads on De Bruyne col.3, lines 18-42 where the known distance D between the transmitters is used in conjunction with the values d1 and d2 to calculate the x and y coordinates. The angle can be calculated as easily as the coordinates.

"prestoring position numbers for discriminating positions of at least one or more ultrasonic signal reception unit for receiving the ultrasonic signals, among a plurality of ultrasonic signal reception units, in order to detect a direction that the mobile robot proceeds," – This limitation does not read on De Bruyne which utilizes one receiver nor on Passey, which does use a plurality of receivers (2) but does not number the position of the receivers. The limitation does read on Lee, where the first receiving unit 311 of Fig. 1 is composed of multiple sensors (paragraph 11). In Fig. 5 these multiple sensors 311 are illustrated disposed about the circumference of the robot and in paragraph 47 the means to determine the orientation of the robot using these sensors is detailed. Although the RF transmitter in Lee is situated on the docking station rather than the robot, the travel time for the RF signal is merely ½ the time used in the application. It would have been obvious to one of ordinary skill in the art at the time of the invention to use the known technique of Lee to improve the similar system of De Bruyne/Passey in the same way to provide a more versatile direction determining means.

"wherein the RF signal is emitted at preset time intervals." – This limitation does not read on De Bruyne, because in De Bruyne the moving object sends an IR signal when it wishes to determine a position, rather than at regular intervals. The limitation does read on Passey, col.2 lines 27-29, which uses RF signals that are sent at regular intervals to allow measuring the distance at regular times. Further, while Passey uses RF signals, it teaches that one can use IR, UV and visible light in place of RF, Col. 1, lines 18-23. It would have been obvious to one of ordinary skill in the art at the time of the invention to substitute a known RF transmitting/receiving element excited at regular

intervals for the infrared transmitting/receiving element transmitting intermittently to

obtain the predictable result of a signal transmitted at the speed of light that allows

measurement of the distance at any time.

Regarding **claim 2**, "The method of claim 1, wherein the angle between the

charging station and the mobile robot is calculated through triangulation based on the

calculated distance value and the preset distance value between the plurality of

ultrasonic signal oscillating units." - Reads on De Bruyne col. 3, lines 18-24, where the

distances d1 and d 2 to the moving object are determined and the distance D between

the two ultrasonic oscillating means is known. The examiner takes official notice that

triangulation is a technique well known those in the engineering sciences. It would have

been obvious to one of ordinary skill in the art at the time of the invention to use the

known technique of triangulation in De Bruyne to determine the angle between the

moving object and the base station.

Regarding **claim 5**, "The method of claim 1, further comprising adding a

semidiameter of the mobile robot to the distance value between the charging station

and the mobile robot." - does not read on De Bruyne because De Bruyne places the

ultrasonic transducer at the point of measurement. When applicant adds a

semidiameter to the distances calculated they are producing a reading from a single

point. The application does however, read on Passey which places the ultrasonic

receivers outboard of the center of the target. At col. 2, lines 55-57, Passey notes that

the range readings calculated based on the ultrasonic receivers displaced from a

centerline can be integrated, by well known methods, to produce a single range reading.

It would have been obvious to one of ordinary skill in the art at the time of the invention

to apply the known technique correcting for the displacement of the measurement point

to De Bruyne's device if the ultrasonic receiver were on placed atop the target.

Regarding **claim 6**, "The method of claim 1, wherein the distance value between

the charging station and the mobile robot is detected through expression S=340[m/sec]

x (T1-T2), wherein 340[m/see] is sound velocity, T1 is time taken to receive an

ultrasonic signal, and T2 is time taken to oscillate an ultrasonic signal after receiving an

RF signal." – This limitation is implied by De Bruyne at col. 3, lines 18-21 where the

counters are started at the time the ultrasonic transmitter oscillates and therefore T1-T2

is accomplished. Further, claim 6 reads on Passey where the electromagnetic signal

and the sonic signals are transmitted simultaneously, so that T2= 0, col. 1, lines 16-18

and col. 2, lines 14-17. Passey teaches that the conversion of time periods into distance

depends on the local speed of sound, col. 3, lines 14-15, which encompasses the

claim's use of 340 m/sec as the speed of sound. Further, Lee uses this equation as

equation 1 after paragraph 38.

Regarding independent **claim 8** "An apparatus for detecting a position of a

mobile robot, the apparatus comprising:

an RF generating unit installed at a mobile robot and configured to emit an RF

(Radio Frequency) signal;" - see discussion of claim 1 and De Bruyne Fig. I, item 7 in

element M.

"an RF reception unit installed at a charging station and configured to receive the

RF signal emitted by the RF generating unit;" - see discussion at claim 1 and De Bruyne

Fig. 1, item 5 in element B.

"a plurality of ultrasonic signal oscillating units each installed at the charging

station and for oscillating ultrasonic signals based on a point of time at which a radio

frequency (RF) signal is emitted; - see discussion at claim 1 and De Bruyne Fig. 1,

elements 1 and 2 which are two ultrasonic oscillating units.

"a control unit configured to control the ultrasonic signal oscillating units so that

the ultrasonic signals are oscillated sequentially whenever the RF signal is received by

the RF reception unit;" - See discussion at claim 1 and De Bruyne Fig. 1 element 4 and

Fig. 3 where signals (b) and (c) are sequentially generated after the synchronizing pulse

(a).

"a plurality of ultrasonic signal reception units each installed on an outer

circumferential surface of the mobile robot and configured to receive the ultrasonic

signals oscillated by the plurality of ultrasonic signal oscillating units; and" - De Bruyne

shows only 1 ultrasonic reception unit 6 in Figure 1, but Lee in Fig. 5 shows a number of

first receiving units 311 installed on an outer circumference of the mobile robot. In

paragraphs 67-78 an alternate use of the configuration of Fig. 5 is discussed using two

transmitters. It would have been obvious to one of ordinary skill in the art at the time of

the invention to adapt the configuration discussed in Lee to the IR/supersonic

transmissions taught by De Bruyne to calculate the distance and angle as illustrated.

"a microcomputer installed in the mobile robot and configured to calculate a

distance and an angle between the mobile robot and the charging station based on

reaching time taken for each ultrasonic signals to reach the mobile robot and a preset

distance value between the plurality of ultrasonic signals oscillating units," - De Bruyne

shows a calculating capability (a computer) at the base station rather than at the mouse.

At the time of the reference, a computer would not fit in a device such as a mouse. At

col. 8, lines 13-25 various alternative placements of the components of the apparatus

are suggested. Placing the computer on the robot is within the simple substitutions that

are possible based on this part of the reference. In addition, Lee shows calculating

units for distance and angle incorporated in the mobile robot.

"wherein the RF signal is emitted at preset time intervals." – This limitation does

not read on De Bruyne or Lee, because in De Bruyne and Lee the moving object sends

an IR/RF signal when it wishes to determine a position, rather than at regular intervals.

The limitation does read on Passey, col.2 lines 27-29, which uses RF signals that are

sent at regular intervals to allow measuring the distance at regular times. Further, while

Passey uses RF signals, it teaches that one can use IR, UV and visible light in place of

RF, Col. 1, lines 18-23. It would have been obvious to one of ordinary skill in the art at

the time of the invention to substitute a known RF transmitting/receiving element excited

at regular intervals for the infrared transmitting/receiving element transmitting

intermittently to obtain the predictable result of a signal transmitted at the speed of light that allows measurement of the distance at any time.

Regarding **claim 9**, which depends on claim 8, "wherein the microcomputer compensates a position error of the mobile robot based on the position of the mobile robot estimated from the calculated distance value and angle value." - It has been shown that De Bruyne allows computation of the position of the movable object- col. 2 line 64 to col. 3 line 42. Therefore, if the microcomputer had a position of the movable device based on another methodology, the position error could be determined by simple arithmetic.

Regarding **claim 10**, which depends on claim 8, "wherein the plurality of ultrasonic signal oscillating units are installed to be symmetric to each other in a horizontal direction of the charging station." - reads on De Bruyne Fig. 1, elements 1 and 2.

Regarding **claim 11**, which is dependent on claim 8, "wherein the plurality of ultrasonic signal oscillating units are installed to be symmetric to each other in vertical and horizontal directions at the charging station." - The examiner takes official notice that only the distance between the ultrasonic oscillating means is used in determining the position of the robot. Therefore, it would have been obvious to one of ordinary skill

in the art at the time of the invention to place the oscillating means at substitute

locations yielding the same positioning information.

Regarding **claim 12**, which depends on claim 8, "wherein the microcomputer

detects a reaching time taken for each ultrasonic signal to be received by one or more

ultrasonic signal reception unit among the plurality of ultrasonic signal reception units

after being oscillated by the plurality of ultrasonic signal oscillating units on the basis of

a point of time at which the RF signal is generated;

calculates a distance between the mobile robot and the charging station based

on the detected reaching time; and

calculates an angle between the mobile robot and the charging station through

triangulation based on the detected reaching time and the preset distance value

between the plurality of ultrasonic signal oscillating units." - This claim recites the

elements of claim 1 which has been rejected based on De Bruyne/Passey/Lee. De

Bruyne uses one ultrasonic signal reception means, Fig 1, element 6. The claim adds

the RF signal being generated at present intervals to the limitations of claim 1, which is

not taught by De Bruyne but does read on Passey, co1.2 lines 27-29, which uses RF

signals that are sent at regular intervals to allow measuring the distance at regular

times. Further, Lee teaches using two reception units selected from a plurality to

calculate the distance and the angle to the docking station. It would have been obvious

to one of ordinary skill in the art at the time of the invention to substitute a known RF

transmitting/receiving element excited at regular intervals for the transmitting/receiving

element transmitting excited intermittently to obtain the predictable result of a signal

traveling at the speed of light that allows measurement of the distance at regular

intervals.

Regarding **claim 13**, which is dependent on claim 8, "wherein the microcomputer

further comprises a storing unit configured to store position numbers for discriminating

positions of the plurality of ultrasonic signal reception unit, and detects a direction that

the mobile robot proceeds through the stored position number of the ultrasonic signal

reception unit which has received the ultrasonic signal among the plurality of ultrasonic

signal reception units." – In Lee, Fig. 6A the reception units 311 are shown as

numbered at #1, through #n, with the knowledge of receptor number used to determine

incident angle of the ultrasonic signal.

Regarding **claim 14**, which is dependent on claim 8, "wherein when the

ultrasonic signals are received by two or more ultrasonic reception units among the

plurality of ultrasonic signal reception units," – Lee shows in Fig. 5 and 6A, multiple

ultrasonic sensors 311 receiving the ultrasonic signals.   "microcomputer calculates a

reaching time taken for each ultrasonic signal to be received by the two or more

ultrasonic signal reception units; selects two ultrasonic signal reception units among the

plurality of ultrasonic signal reception units which have received ultrasonic signals

whose reaching time is the fastest, among the calculated reaching time values; and

calculates a distance between the mobile robot and the charging station based on the

reaching time of the ultrasonic signals which have been received by the two selected ultrasonic signal reception units." – Lee Paragraph 41 and 42 describe how the times from the two sensors receiving the ultrasonic signals are used to calculate distance and angle to the docking station using equations 1 and 2. It would have been obvious to one of ordinary skill in the art at the time of the invention to incorporate this capability in the De Bruyne/Passey combination to use this known technique to improve a similar device and provide a redundant calculation method.

Regarding **claim 15**, which is dependent on claim 8, "wherein the microcomputer detects the distance between the charging station and the mobile robot through expression S=340[m/see] x (T1-T2), wherein 340[m/see] is sound velocity, T1 is time taken to receive an ultrasonic signal, and T2 is time taken to oscillate an ultrasonic signal after receiving an RF signal." - Reads on Passey where the electromagnetic signal and the sonic signals are transmitted simultaneously, so that T2= 0, col. 1, lines 16-18 and col. 2, lines 14-17. Passey teaches that the conversion of time periods into distance depends on the local speed of sound, col. 3, lines 14-15, which encompasses the claim's use of 340 msec as the speed of sound.

Regarding independent **claim 17**, "An apparatus for detecting a position of a mobile robot, the apparatus comprising:

an RF generating unit installed at a mobile robot and configured to emit an

RF(Radio Frequency) signal; " - - see discussion of claim 1 and De Bruyne Fig. l, item 7

in element M.

"an RF reception unit installed at a charging station and configured to receive the

RF signal emitted by the RF generating unit;" - see discussion at claim 1 and De Bruyne

Fig. 1, item 5 in element B.

"a plurality of ultrasonic signal oscillating units each installed at the charging

station and for oscillating ultrasonic signals;" - see discussion at claim 1 and De Bruyne

Fig. 1, elements 1 and 2 which are two ultrasonic oscillating units.

"a control unit configured to control the ultrasonic signal oscillating units so that

the ultrasonic signals are oscillated sequentially whenever the RF signal is received by

the RF reception unit;" - See discussion at claim 1 and De Bruyne Fig. 1 element 4 and

Fig. 3 where signals (b) and (c) are sequentially generated after the synchronizing pulse

(a).

"a plurality of ultrasonic signal reception units each installed on an outer

circumferential surface of the mobile robot and configured to receive the ultrasonic

signals oscillated by the plurality of ultrasonic signal oscillating units; and'" - De Bruyne

shows only 1 ultrasonic reception unit 6 in Figure 1, but Lee in Fig. 5 shows a number of

first receiving units 311 installed on an outer circumference of the mobile robot. In

paragraphs 67-78 an alternate use of the configuration of Fig. 5 is discussed using two

transmitters. It would have been obvious to one of ordinary skill in the art at the time of

the invention to adapt the configuration discussed in Lee to the IR/supersonic

transmissions taught by De Bruyne to calculate the distance and angle as illustrated.

"a microcomputer installed in the mobile robot and configured to calculate a

distance and an angle between the mobile robot and the charging station based on

reaching time taken for each ultrasonic signals to reach the mobile robot and a preset

distance value between the plurality of ultrasonic signals oscillating units," – De Bruyne

shows a calculating capability (a computer) at the base station rather than at the mouse.

At the time of the reference, a computer would not fit in a device such as a mouse. At

col. 8, lines 13-25 various alternative placements of the components of the apparatus

are suggested. Placing the computer on the robot is within the simple substitutions that

are possible based on this part of the reference. In addition, Lee shows calculating

units for distance and angle incorporated in the mobile robot.

"wherein the microcomputer further comprises a storing unit configured to store

position numbers for discriminating positions of the plurality of ultrasonic signal

reception units, and detects a direction that the mobile robot proceeds through the

stored position number of the ultrasonic signal reception unit which has received the

ultrasonic signal among the plurality of ultrasonic signal reception units." – In Lee, Fig.

6A the reception units 311 are shown as numbered at #1, through #n, with the

knowledge of receptor number used to determine incident angle of the ultrasonic signal.

Regarding independent **claim 18**, "An apparatus for detecting a position of a

mobile robot, the apparatus comprising:

an RF generating unit installed at a mobile robot and configured to emit an RF

(Radio Frequency) signal;" - see discussion of claim 1 and De Bruyne Fig. I, item 7 in

element M.

"an RF reception unit installed at a charging station and configured to receive the

RF signal emitted by file RF generating unit; " - - see discussion at claim 1 and De

Bruyne Fig. 1, item 5 in element B.

"a plurality of ultrasonic signal oscillating units each installed at the charging

station and for oscillating ultrasonic signals;" - see discussion at claim 1 and De Bruyne

Fig. 1, elements 1 and 2 which are two ultrasonic oscillating units.

"a control unit configured to control the ultrasonic signal oscillating units so that

the ultrasonic signals are oscillated sequentially whenever the RF signal is received by

the RF reception unit;" - See discussion at claim 1 and De Bruyne Fig. 1 element 4 and

Fig. 3 where signals (b) and (c) are sequentially generated after the synchronizing pulse

(a).

"a plurality of ultrasonic signal reception units each installed on an outer

circumferential surface of the mobile robot and configured to receive the ultrasonic

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first receiving units 311 installed on an outer circumference of the mobile robot. In

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transmitters. It would have been obvious to one of ordinary skill in the art at the time of

the invention to adapt the configuration discussed in Lee to the IR/supersonic

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"a microcomputer installed in the mobile robot and configured to calculate a

distance and an angle between the mobile robot and the charging station based on

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distance value between the plurality of ultrasonic signals oscillating units," - De Bruyne

shows a calculating capability (a computer) at the base station rather than at the mouse.

At the time of the reference, a computer would not fit in a device such as a mouse. At

col. 8, lines 13-25 various alternative placements of the components of the apparatus

are suggested. Placing the computer on the robot is within the simple substitutions that

are possible based on this part of the reference. In addition, Lee shows calculating

units for distance and angle incorporated in the mobile robot.

"wherein when the ultrasonic signals are received by two or more ultrasonic

signal reception units among the plurality of ultrasonic signal reception units, the

microcomputer calculates reaching time taken for each ultrasonic signal to be received

by the two or more ultrasonic signal reception units; selects two ultrasonic signal

reception units which have received ultrasonic signals whose reaching time is the

fastest, among the calculated reaching time values; and calculates a distance between

the mobile robot and the charging station based on the reaching time of the ultrasonic

signals which have been received by the two selected ultrasonic signal reception units."

– Lee shows in Fig. 5 and 6A, multiple ultrasonic sensors 311 receiving the ultrasonic

signals. ." – Lee Paragraph 41 and 42 describe how the times from the two sensors

receiving the ultrasonic signals are used to calculate distance and angle to the docking

station using equations 1 and 2. It would have been obvious to one of ordinary skill in

the art at the time of the invention to incorporate this capability in the De Bruyne/Passey

combination to use this known technique to improve a similar device and provide a

redundant calculation method.

Conclusion

The prior art made of record and not relied upon is considered pertinent to

applicant's disclosure. U.S. Patent No. 4,701,893 to Muller et al. for ultrasonic sensors

disposed circumferentially on a robot, U.S. Patent No. 5,652,593 to Rench et al. for

circumferential sensors for measuring distance and angle, U.S. Patent No. 5,758,298 to

Guldner for circumferential sensors on a robot for identifying obstacles, U.S. Patent No.

5,819,008 to Asama et al. for coded peripheral sensors and transmitters, U.S. Patent

No. 6,459,955 to Bartsch et al. for home cleaning robot, U.S. Patent No. 7,024,278 to

Chiappetta et al for sonic wave utilization, and U.S. Patent Pub. No. 2003/0001777 to

Johnson for analysis of location methodology.

Any inquiry concerning this communication or earlier communications from the

examiner should be directed to LIN B. OLSEN whose telephone number is (571)272-

9754. The examiner can normally be reached on Mon - Fri, 8:30 -5.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's

supervisor, Thomas G. Black can be reached on 571-272-6956. The fax phone number

for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the

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/Lin B Olsen/
Examiner, Art Unit 3661

/Thomas G. Black/
Supervisory Patent Examiner, Art Unit 3661